

IN THE CLAIMS:

1. (Currently Amended) A Coriolis mass flow meter, comprising:

two parallel flow tubes curved into an arch shape having joint ends, each of the joint ends having an end direction;

5 an entry-side manifold with curved branches connected to one set of said joint ends of said two flow tubes, said branches each carrying a portion of a fluid being measured from an inlet port into said two flow tubes, said entry-side manifold being a separate structure than said two parallel flow tubes;

10 an exit-side manifold with curved branches connected to another set of said joint ends of said two flow tubes, said exit-side manifold with curved branches converging flows of said fluid being measured flowing in said two flow tubes into an outlet port to discharge said fluid being measured, said exit-side manifold being a separate structure than said two parallel flow tubes;

15 a drive unit for driving and resonating one of said flow tubes with another of said flow tubes at mutually opposite phases; and

20 a pair of oscillation sensors installed along said two parallel flow tubes curved into an arch shape at locations horizontally symmetrical with respect to an installation location of said drive unit for sensing a phase difference proportional to a Coriolis force, said two flow tubes being connected to said entry-side manifold and to said exit-side manifold at respective said joint ends and said two flow tubes being formed into the arch shape that is bent in only one direction, said entry-side manifold curved branches being smoothly bent from an inlet direction

of said entry-side manifold to a connection direction at an end of said two manifold outlets that is the same as the end direction of said joint ends, said exit-side manifold curved branches being smoothly bent from an outlet direction of said exit-side manifold to a connection direction at an end of said two manifold inlets that is the same as the end direction of said joint ends.

2. (Original) A Coriolis mass flow meter as set forth in claim 1 further comprising a sealed pressure-resistant case of a cylindrical shape in axis direction, with openings of the cylindrical portion thereof closed by end plates, wherein said entry-side and exit-side manifolds are installed at corners of said cylindrical portion and passed through said corners.

3. (Previously Presented) A Coriolis mass flow meter as set forth in claim 1 wherein:  
a pressure-resistant case is arranged around said two flow tubes;  
said entry-side and exit-side manifolds have a pair of integrally formed disc-shaped flanges, to which both ends of said pressure-resistant case are fixedly fitted;  
the cross-sectional shape of said pressure-resistant case being an oval shape with the major axis oriented in the curved direction of said flow tubes, with the length of said major axis smoothly and gradually reduced from the axial central part thereof to both ends thereof into a substantially circular shape over a predetermined length near both ends.

4. (Original) A Coriolis mass flow meter as set forth in Claim 3 further comprising a temperature sensor provided on said pressure-resistant case for compensating the thermal

effects of a distance between fixed ends on both sides of said flow tubes, and a temperature sensor provided near said joints connecting said flow tubes to said manifolds for compensating the thermal effects of the rigidity of said flow tubes.

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5. (Currently Amended) A Coriolis mass flow meter comprising:

two flow tubes each having only one a curve and each flow tube having first and second joint ends, each curve of said flow tubes lying in a respective plane, said planes of said curves of said flow tubes being arranged substantially parallel, said each curve being in only one direction and forming an arch extending fully from a respective said first joint end to a respective second joint end;

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an entry-side manifold with an inlet port portion and two outlet ports forming branches curved with respect to the inlet port portion, said two outlet port branches being connected to said first joint ends of said two flow tubes and dividing an entry passage from said inlet port into said branches joined to said two flow tubes, said entry passages having a smooth curve from said inlet port to said outlet ports with an axial direction of each of said outlet ports at an acute angle relative to said an axial direction of said inlet port, an axial direction of said entry passage at said outlet ports being in a substantially same direction as an axial direction of a respective said flow tube at said respective first joint end of said respective flow tube, said entry-side manifold being a separate structure than said two flow tubes;

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15 an exit-side manifold with an outlet port portion and two inlet port branches, said inlet port branches being connected to said second joint ends of said two flow tubes and joining exit

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passages from said inlet ports to said outlet port portion, each of said exit passages having a smooth curve from respective said inlet ports to said outlet port with an axial direction of each of said inlet ports at an acute angle relative to an axial direction of said outlet port portion, an axial direction of said exit passages at said inlet ports being in a substantially same direction as an axial direction of a respective said flow tube at said respective second joint end of said respective flow tube, said exit-side manifold being a separate structure than said two parallel flow tubes;

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a drive unit for driving and resonating one of said flow tubes with respect to another of said flow tubes at mutually opposite phases;

a pair of oscillation sensors installed at locations symmetrical with respect to said drive unit for sensing a phase difference proportional to a Coriolis force of fluid in said two flow tubes.

6. (Previously Presented) A meter in accordance with claim 5, wherein:

said axial directions of said first joint ends is non-parallel with said axial directions of said second joint ends.

7. (Previously Presented) A meter in accordance with claim 5, wherein:

said axial directions of said first joint ends is angularly spaced from said axial directions of said second joint ends.

8. (Previously Presented) A meter in accordance with claim 5, further comprising:  
a sealed pressure case surrounding said two flow tubes, said pressure case having a cylindrical shape with ends of said cylindrical shape closed by end plates and forming corners with said cylindrical shape, said entry and exit manifolds being arranged in said corners of said case.

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9. (Previously Presented) A meter in accordance with claim 8, wherein:  
said end plates are flanges of said entry and exit manifolds;  
a radial cross section of said pressure case has an oval shape with a major axis of said oval shape being oriented in a curved direction of said flow tubes, a length of said major axis being a maximum at a central portion of said pressure case and diminishing toward said ends of said cylindrical shape to have said cross section of said pressure case change to a substantially circular shape at said ends of said cylindrical shape.

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10. (Previously Presented) A meter in accordance with claim 8, further comprising:  
a first temperature sensor arranged on said pressure case and measurable of temperatures effecting a distance between said joint ends of said flow tubes;  
a second temperature sensor arranged on one of said flow tubes and said manifolds, said second temperature sensor being measurable of temperatures effecting rigidity of said flow tubes.

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11. (Previously Presented) A meter in accordance with claim 5, wherein:

said each curve is continuous from said first joint end to said second joint end.

12. (Currently Amended) A Coriolis mass flow meter comprising:

an entry-side manifold with an inlet portion and integral first inlet branch and integral second inlet branch, said inlet portion extending in an axial direction, said first inlet branch bending to terminate at a first inlet branch end with a first inlet connection direction at an acute angle to said axial direction, said second inlet branch bending to terminate at an second inlet branch end with a second inlet connection direction at an acute angle to said axial direction;

an exit-side manifold with an outlet portion and integral first outlet branch and integral second outlet branch, said outlet portion extending substantially in said axial direction, said first inlet branch bending to terminate at a first inlet branch end with a first inlet connection direction at an acute angle to said axial direction, said second inlet branch bending to terminate at an second inlet branch end with a second inlet connection direction at an acute angle to said axial direction;

15 a first arched flow tube having a curve in only one direction and lying in a first plane, said first arched flow tube extending from a first arched flow tube first joint end to a first arched flow tube second joint end, said first arched flow tube first joint end being along said first inlet connection direction and being connected to said first inlet branch end and said first arched flow tube second joint end being along said first outlet connection direction and being connected to said first outlet branch end, said first arched flow tube being a separate structure

than said entry-side and said exit-side manifolds;

20 a second arched flow tube having a curve in only one direction and lying in a second plane, said second arched flow tube extending from a second arched flow tube first joint end to a second arched flow tube second joint end, said second arched flow tube first joint end being along said second inlet connection direction and being connected to said second inlet branch end and said second arched flow tube second joint end being along said second outlet connection direction and being connected to said second outlet branch end, said first plane and 25 said second plane being substantially parallel, said second arched flow tube being a separate structure than said entry-side and said exit-side manifolds;

a drive unit for driving and resonating said first arched flow tube with respect to said second arched flow tube at mutually opposite phases;

30 a pair of oscillation sensors installed at locations symmetrical with respect to said drive unit for sensing a phase difference proportional to a Coriolis force of fluid in said two flow tubes.

13. (New) A Coriolis mass flow meter comprising:

a plurality of tubes with each tube having first and second joint ends, each of said plurality of tubes having only a single curve in one direction, said curve forming an arch extending fully from a respective said first joint end to a respective second joint end;

5 first and second manifolds formed separately from said plurality of tubes, each said manifold having a main branch and a plurality of divided branches, each of said divided branches

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having a curve in one direction with respect to said main branch, said divided branches of said first manifold being connected to said first joint ends of said plurality of tubes with ends of said divided branches being in a same direction as said first joint ends of said plurality of tubes, said divided branches of said second manifold being connected to said second joint ends of said plurality of tubes with ends of respective said divided branches being in a same direction as said second joint ends of said plurality of tubes;

a drive unit connected to said tubes for driving and resonating one of said tubes with respect to another of said tubes at mutually opposite phases;

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a pair of oscillation sensors connected to said tubes at locations symmetrical with respect to said drive unit for sensing a phase difference proportional to a Coriolis force of fluid in said two flow tubes.

14. (New) A flow meter in accordance with claim 13, wherein:

said curve of said tubes and said divided branches are shaped to have said main branches of said manifolds be substantially aligned with each other when said divided branches are connected to said tubes.

15. (New) A method in accordance with claim 13, wherein:

said curve of said tubes and said divided branches are shaped to have said curves of said divided branches of said manifolds be substantially in the same plane as said curve of a respective said tube when said tubes are connected to said manifolds.

16. (New) A method in accordance with claim 14, wherein:

said curve of said tubes and said divided branches are shaped to have said curves of said divided branches of said manifolds be substantially in the same plane as said curve of a respective said tube when said tubes are connected to said manifolds.

17. (New) A method for forming a Coriolis mass flow meter, the method comprising:

providing a plurality of tubes with each tube having first and second joint ends; bending each of said plurality of tubes into only a single curve in one direction, said curve forming an arch extending fully from a respective said first joint end to a respective second joint end;

5 providing first and second manifolds separate from said plurality of tubes, each said manifold having a main branch and a plurality of divided branches;

bending each of said divided branches into a curve in one direction with respect to said main branch;

10 connecting said divided branches of said first manifold to said first joint ends of said plurality of tubes with ends of said divided branches being in a same direction as said first joint ends of said plurality of tubes;

connecting said divided branches of said second manifold to said second joint ends of said plurality of tubes with ends of respective said divided branches being in a same direction as said second joint ends of said plurality of tubes;

15 connecting a drive unit to said tubes for driving and resonating one of said tubes with

respect to another of said tubes at mutually opposite phases;

connecting a pair of oscillation sensors to said tubes at locations symmetrical with respect to said drive unit for sensing a phase difference proportional to a Coriolis force of fluid

20 in said two flow tubes.

18. (New) A method in accordance with claim 17, wherein:

said bending of said tubes and said divided branches is performed to have said main branches of said manifolds be substantially aligned with each other after said connecting of said divided branches to said tubes.

19. (New) A method in accordance with claim 17, wherein:

said bending of said tubes and said divided branches is performed to have said curves of said divided branches of said manifolds be substantially in the same plane as said curve of a respective said tube after said connecting of said divided branches to said tubes.

20. (New) A method in accordance with claim 18, wherein:

said bending of said tubes and said divided branches is performed to have said curves of said divided branches of said manifolds be substantially in the same plane as said curve of a respective said tube after said connecting of said divided branches to said tubes.